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ABSTRACT

This instructor's guide presents analytical methods for residual chlorine and turbidity. Topics include sample handling, permissable concentration levels, substitution of residual chlorine for bacteriological work, public notification, and the required analytical techniques to determine residual chlorine and turbidity. This publication is intended for training drinking water treatment plant operators with little experience. (CO)

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United States
Environmental Protection
Agency

National Training
and Operational
Technology Center
Cincinnati OH 45268

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Determination of Residual Chlorine and Turbidity in Drinking Water

Instructor's Manual

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SE 035 918

December 1978

THE DETERMINATION OF RESIDUAL CHLORINE AND TURBIDITY

IN

DRINKING WATER

This manual was developed by the U. S. Environmental Protection Agency, National Training and Operational Technology Center in response to a request from the Office of Drinking Water.

INSTRUCTOR'S MANUAL

National Training and Operational Technology Center
Municipal Operations and Training Division
Office of Water Program Operations
U. S. Environmental Protection Agency

DISCLAIMER

Reference to commercial products, trade names, or manufacturers is for purposes of example and illustration. Such references do not constitute endorsement by the Office of Water Program Operations, or the Office of Drinking Water, U. S. Environmental Protection Agency.

This manual has been prepared from the National Interim Primary Drinking Water Regulations and the references contained therein which constitute the legal authority for these procedures. When used within a State having been granted primary enforcement authority, that State's regulations will then constitute the legal authority and should be followed.

INTRODUCTION

The purpose of this manual is to assist the instructor(s) who will be presenting this course. Regulations have set down certain requirements for residual chlorine and turbidity determinations. Due to samples for these parameters having to be analyzed within one hour and also the number involved, it is anticipated that these analyses will be done at the sampling site. Unlike the other parameters in the Primary Regulations the chlorine and turbidity analyses will probably be done by the operators as opposed to laboratories. Consequently, the regulations say that the analyses may be done by any one acceptable to the State.

It has been suggested that States provide some type of training to assure that the proper procedures are carried out and to explain the requirements to the persons who will carry out these analyses. It is hoped that this manual and its companion "Participant's Manual" will serve as a guide in providing the training.

The instructors who contemplate use of this manual should read the entire thing before attempting to use it. Because States will adopt their own legislation and be the principal authority connected with protection of Drinking Water Quality, differences will occur between their document and the Federal document and the Federal document upon which this manual has been based.

The principal which should guide the instructor in offering any course in these subjects is to provide a hands-on learning experience for the operators. This would include providing as many acceptable pieces of equipment of different manufacturers as possible. This allows the operator to see what is available. Operators should be encouraged to bring samples of their waters to analyze and, if possible, any analytical equipment used in their plants.

If the instructor chooses to have students prepare reagents and do pipetting, etc., he may wish to add a period of training on these basic laboratory skills. Choices have been built into the laboratory procedures to keep laboratory skill at a basic minimum. A pre-course survey of student laboratory skills could be made upon receiving the students application. This could provide the instructors with a picture of what is needed by the class in the way of basic laboratory skills.

A suggested checklist which could be used to get an indication of the students' basic skills has been included in this manual. It can and should be modified to meet the needs as the instructor see them.

Since it is not known how much experience the instructor has in presenting courses, a section on preparing to present this course has been included. There should be at least two instructors presenting the course. One who has knowledge of the State's requirements on residual chlorine and turbidity should explain the States position on such things as public notification, substitution and sampling. The second person should be responsible for explanation of the chemical requirements on the methods and equipment.

The instructor(s) should modify the course content to fit the needs of each offering.

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PRE-COURSE ACTIVITIES

Introduction

It is anticipated that this course will be taken to the student, i.e., offered in the "field." Since the target trainee will be operators within a State, the course can be a traveling short school provided by the State. The course also could be included in regularly scheduled schools for operators.

If the course is to be used occasionally to train persons who will eventually be instructors in the course, it should be offered as it will be for the operators. This tends to allow the future instructors to see how the "expert" does it and to experience the source as an operator would. In obtaining this experience he will be better able to modify the course to fit the needs in his area.

It would be well in this introduction to provide a list of characters. The "instructor" could be a member of the State Water Supply Authority itself or a person assigned to carry out the training. He could also be a contracted person from a college or university. He will be responsible for offering the course in many areas of the State which may fall under different local responsible areas. As he radiates out from his central location, such as the State Capitol, he will need a contact person known in that local area to assist him.

This is the second person of the team, that is the "contact person." This person may differ as the local area changes. However, his duties will remain the same and will be explained more in this section.

The last person we can refer to as the "Administrator." The Administrator may be the same person as the contact person or may differ. The Administrator should be a person prominent in the State Water Supply field. His name and position will tend to lend more authority to the course and will set the tone of the course by reviewing the requirements of the State on all points connected with chlorine and turbidity analysis. He can attend the opening session and present the first talk, then as time permits, return to his office or stay.

I. COURSE LOGISTICS

A. Announcement of the Course

The decision to offer this course will be based upon need for the information contained in it. As the State brings its Safe Drinking Water Program up to full scale the need would be greatest and would decline thereafter. Usually after the local area knows the course exists, it can be scheduled to meet the time commitments of both the instructor and contact person. The contact person should be identified to the instructor after agreement between the respective heads of the State and local programs.

After establishment of contact between the instructor and the contact person, the instructor can make available the materials needed at the local site. The contact person has the responsibility to provide a) the actual site of offering; b) the students themselves; and c) any equipment not provided by the instructor (See lists Page 40.)

The contact person will know of all the water supplies in the area and can contact each supply requesting participation of operators and supplying the time, location and brief description of the course. He should obtain a definite commitment that the treatment facility will send someone and that the facility will provide the name of the person or persons at a later time. A written announcement should be sent out as soon as a date is confirmed. Confirmation of the date should take into consideration availability of the site where the course is to be offered. An example course announcement and application are included.

The instructor may wish to ask his contact person to obtain certain biographical information on the students. When the instructor is planning the course he may decide that information on the operators skill with basic laboratory procedures is needed. It would be well if the instructor would design some type of check sheet and perhaps even the course announcement. He could provide the forms to the contact person for distribution to prospective trainees.

Approximately two months time should be allowed between the mailing of the course announcements and the course offering. This will provide sufficient time to ship equipment, contact the students, and arrange the site. The trainees themselves may need time to rearrange their schedules and apply for travel. This time requirement may be reduced as the instructor has more experience in offering the course and with shorter distances between the home base and the course offering site.

The following identification of contents of a course announcement will be helpful as a checklist to those preparing an original course announcement. Example announcements are shown in Section II, Pages 17, 18 and 19.

1. Course title
2. Date and location
3. Name of organization conducting the course (and name of co-sponsor, if applicable)
4. For whom the training is intended
5. Reason why this training is needed
6. Identification of knowledge and skills the participant will have on satisfactorily completing the course.

7. Description of the training environment to be used (classroom, laboratory)
8. Prerequisites for attendance (identification of special knowledge and skills, or completion of other training, which applicant must have for admission). Include any materials the student should bring to the course (sample, equipment)
9. Tuition (if applicable)
10. How and where to apply for admission to this course.

B. Course Milestones

The following pages list individual responsibilities in chronological order for preparation for this course.

The ultimate list of responsibilities will vary with the modifications of this course by the instructor. Suggestions and modifications have been included in the design of this course for the information of the course instructor. The instructor should review this manual for the options included and using this manual as a core, design it to fit his specific needs.

The miletsones chart lists job titles for each instructional unit. It will be obvious that the job titles are descriptive of the persons duties in this course. The times are suggestions for persons who have never given the course and may change, particularly after the course has been given several times. The job titles should convey the following:

Administrator: A person holding a position of authority in the area of water supply in the State. The person may be the same for all listed responsibilities or may actually be several persons. For example, the chief administrator for the State's Water Supply Group may wish to contact local persons, but may delegate authority to present lectures to another person in his group.

Instructor: May also be referred to as course director. This person will have been assigned the task, by the administrator, of presenting this course throughout the State. This person should be knowledgeable of all topics in the course, preferably a chemist or person having experience with the chemical procedures.

Contact Person: A local official, county or regional, water supply official. He should have personal familiarity with local water treatment personnel. He may be delegated the responsibility for aiding the instructor whenever the course is presented in his region.

Course Secretary: A clerical person who has been given a specific assignment of assisting the instructor in all clerical, record keeping and related functions. Does not travel.

AGENDA TOPICS	RESPONSIBILITIES
Registration	Contact Person
State Requirements for Compliance on Chlorine and Turbidity	Administrator
Analysis for Chrlorine	Instructor
Analysis for Turbidity	Instructor
Lab Briefing	Instructor
Laboratory	Instructor and Contact Person
Course Closing	Contact Person and Instructor

MILESTONE CHART	Administrator	Instructor	Contact Person	Course Secretary	Completed by	REMARKS
6 to 8 Months before Course						
Determine need and decide to have course	x					
Designate Instructor and Secretary	x					
Begin to plan equipment needs and method of shipment		x				Number of pieces - may wish to see about truck from motor pool to haul equipment. (See equipment list).
Requisition equipment (See Page 40)		x				Turbidimeter and packing boxes for equipment.
Develop course announcement		x		x		
2 to 3 Months before Course						
Designate general locality in State for course	x					
Together with local official, designate contact person	x					
Contact the contact person with needs for course (see Page 37)		x				Site - equipment - students - can be by phone
Mail announcements to contact person				x		Include any forms for student information.
Mail announcement to local treatment plants			x			
Inventory course manual		x				The first time this will be the procurement of the manuals. Thereafter see that numbers are sufficient.
Read manual and make any changes to fit needs		x				This would be mostly for the first offering.
Prepare visual aids for agenda topics		x		x		

MILESTONE CHART	Administrator	Instructor	Contact Person	Course Secretary	Completed by	REMARKS
1 month before Course						
Send confirmation of course attendance			x			Include nearby motel address and phone for those who may have to stay overnight. May wish to have secretarial assistance on his end.
Order consumable supplies (See Page 41)		x	x			
Reserve classroom and laboratory			x			
1 week before Course						
Obtain needed equipment (See Page 42)			x			Visual aid equipment
Pack boxes (shipping)		x				
Course materials (handouts) (See Page 15)				x		
Manuals				x		
Ship boxes		x				Not if Instructor transports. Only if they go ahead.
2 days before Course						
Travel to site		x				Will depend on distance and mode of travel.
1 day before Course						
Set up classroom and laboratory		x	x			
Course Day						
Register students			x			
Have roster and certificates typed			x			
Pass out critiques			x			
Pass out pre-test		x				If used.
Explain		x				

MILESTONE CHART	Administrator	Instructor	Contact Person	Course Secretary	Completed by	REMARKS
Course Day Cont'd.						
Conduct Lectures (See Agenda)						
State Regulations	x		x			One or the other (Administrator or Contact Person).
Analysis for Chlorine		x				
Analysis for Turbidity		x				
Lab. Briefing		x				
Conduct Laboratory		x	x			
Conduct Course Closing	x	x	x			All should be present if possible.
Post Test						
Certificates						
Critiques						
Day after Course						
Pack shipping boxes		x	x			
Ship boxes			x			Unless the Instructor transports them.

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C. Resources

The size of the class will depend on many things. For one thing, the number of students the instructor feels comfortable with; the size of the classroom and laboratory are also very important. If the contact person actually knows the subject matter and can assist in the laboratory, this will mean a class can be larger. It is assumed that a class of from 20 to 25 trainees will be the most usual size and equipment lists will be based on this number.

1. Training Staff

If this course is to be offered routinely or if this course is to be added to already existing training courses, then a training staff should be available to the State. This course would necessitate one person to offer the course. However, a back-up instructor would be advisable. Secretarial help should be provided. The secretary will not be needed full-time unless other training is being carried out. However, the secretary should be assigned as part of their workload to assist in training. Do not attempt to add this duty as it is needed.

This course, as with others, will demand the most time the first few times it is given. As the instructor becomes familiar with the necessities of the course, his time requirements will lessen.

The actual course time is only one day, however, a total of three days should be allotted for its presentation. This would include the travel time, set-up of the laboratory and classroom, course presentation and repacking the equipment. It is assumed that the contact person will assist in set-up and repacking.

A listing of each member of the team needed to offer this course and their duties are shown below:

a. Instructor

This person will have overall responsibility for this course each time it is offered.

Before the course the instructor receives his assignment from his supervisor to lead the course, after which he

1) Begins to plan his course using this manual as a guide and reminder of things to be included. Planning should include equipment needs, in particular capital equipment, such as the number and types of turbidimeters. He may wish to borrow these items if his course schedule is not heavy or prolonged. Another item he may wish to develop are the boxes to ship the equipment in. Requisitions should be let as soon as possible after determining needs. Additional information on equipment needs can be found on the equipment lists.

2) Develop the course announcement, to include questions to obtain all information needed. This should be developed into a packet, for example, to include a skills questionnaire as well as a list for the contact person on needs he is to provide before the course.

3) Contact the contact person via phone to introduce yourself and go over what is needed. A mailing covering the same topics should follow.

4) Check the manuals. The first time the course is offered the instructor must read the entire manual and decide if any changes are needed to make the manual fit the State's requirements and have these changes made. After this has been done all this section will need is to be sure there are enough manuals for the course. Be sure that extra manuals are taken to the course, at least one for the contact person and any lecturers in the course.

5) Prepare visual aids. Visual aids always make any presentation better. There are visual aids available with this instructor's manual. However, the instructor may wish to prepare some for the State requirements or additional ones. Visual aids for all topics should be prepared. They can be offered to other lecturers for their use prior to the course. When other instructors have them, they will indicate what topics are to be covered by this lecturer. Once prepared, a great deal of work for this section will not have to be repeated for each offering.

6) Order consumable supplies; such as turbidity standards or other chemicals. This will be taken care of earlier for the first course. However, for other offerings it can be done at a later time.

7) Pack boxes for shipment, this would include all capital, consumable, glassware, and handout material necessary to present the course. If two offerings of the course have been scheduled, the shipping boxes could be shipped by freight between locations and a special box carried by the instructor used to replenish the shipping boxes with consumable, handout and any broken equipment.

8) Ship boxes, if going ahead of the instructor, i.e., by motor freight, etc.

b. Contact Person

This person should be assigned to assist the instructor by his supervisor. Thereafter, he will receive guidance in fulfilling the needs of the course from the instructor, these would include:

1) Mail course announcements to prospective trainees; these will probably be all water treatment plants in his region. It could also include all local staff who are responsible for inspecting or visiting treatment plants.

2) Send confirmation of course registration to trainees; upon receipt of an application. This should include directions to the site, local motels (in case a person is coming from a distant section of the region), telephone number of contact person, course starting times, etc. This may require secretarial help and the contact person should request this assistance from his supervisor. A running list of confirmed trainees should be kept and occasional reports made to the instructor.

3) Order consumable supplies. This will depend upon what has been requested by the instructor, an example would be distilled water.

4) Reserve classroom and laboratory. These should be separate from each other. They should be large enough to house the number of trainees anticipated. Consult the section on Training Facilities. This should be taken care of early enough to assure attaining the best possible location and being able to send directions to the instructor and trainees. Example locations, are community colleges, public health departments, high schools, etc.

5) Obtain needed equipment (see list) such as projectors, screens, etc. One thing which is nice to have, but not necessary, is coffee for the breaks. The students can pay for the coffee thereby reimbursing the contact person. If this is to be done, coffee pot(s), consumables, and supplies should be gotten.

6. Receive, store, and transport shipping boxes. If the instructor's equipment for the course is shipped, it will be sent to an address supplied to the instructor by the contact person. Upon arrival the contact person should receive it or make arrangements to have it received. It should be stored in a secure place until arrival of the instructor and some arrangements made to transport it to the course site, if it is not there.

7) Assist instructor in setting up the classroom and laboratory.

8) Register students. Compare those in attendance to those on the list as having applied for the course. Pass around an attendance roster. The contact person should begin the course as he is known to most of the trainees and can introduce the instructor and any other lecturers to the students.

9) Have roster and certificates typed. The contact person should arrange for someone at the site to provide typing assistance. The name and affiliation of each student should be included in the roster, see example form. The certificates of attendance, if used, should be supplied by the instructor with the student's name blank, this can be typed in from the attendance roster.

10) Assist instructor in conducting laboratory.

11) Assist instructor in conducting course closing; i.e., passing out certificates.

12) Assist instructor in repacking boxes.

13) Ship boxes to address supplied by instructor.

c. Administrator

Distinction must be made here that this could actually be several different persons. One person would be the instructor's supervisor and another, the person who presents the lecture in the course. They could also be the same person. The administrator's duties would be:

1) Determine the need and decide to have the course. If analysis of turbidity and residual chlorine are to be carried out at the sampling site by operators, the State will need to train these operators in how this is to be carried out to comply with the State regulations. The administrator of the State's Water Supply Program could decide to offer a training course for the operators.

2) Designate the instructor responsible for the course. After deciding to offer the course, someone would have to be designated as being responsible for putting on the course. The responsibility for picking the instructor may be delegated to someone other than the administrator. A part of this designation of responsibility should be to provide secretarial support to the instructor.

3) Choose locality and contact the local supervisor. This will be done to provide a contact person for the instructor.

4) Participate in training course. Present the State's requirements on turbidity, residual chlorine, public notification, sampling, and analysis. Also, pass out the certificates if his time permits.

d. Course Secretary

Should have this persons supervisor directly communicate that assistance is permitted. Then the course secretary should assist the instructor each time the course is presented and keep records of attendance of each offering.

2. Training Facilities

a. General Considerations: The following section describes a complete list of equipment and facilities that could be needed. A good, well equipped training center should have all the items to be able to utilize all forms of visual aids. However, not all items are required to present a training course.

1) This course requires both classroom and laboratory space for class use. Effective presentation of the course requires staff attention to many details related to these facilities. Problems more often occur in field courses (i.e., away from "home base").

In any location it is unusual that all desired features of a training facility will be met, but with timely attention, most problems can be solved or at least partially resolved.

2) Spatial Relationships

Classroom and laboratory should be separate, but close together. Much of the instruction requires frequent shifts between classroom and laboratory. Therefore, the classroom and laboratory must not be in widely separated buildings, and should not be far apart in any structure.

3) Associated Comforts

a) The classroom and the laboratory should have a comfortable temperature, be free of obvious drafts, be well-ventilated, and should be well-lighted. It is, of course, possible to develop specifications for acceptable temperature ranges, light intensity ranges, humidity, etc.; but there is no substitute for exercise of good judgment.

b) Suitable restroom and drinking fountain facilities should be convenient to the classroom and laboratory.

c) Smoking

(1) NO SMOKING IN THE LABORATORY. There should be no compromise on this.

(2) Some schools permit smoking in the classrooms. If this is the practice, it is advisable to locate ashtrays so that smokers sit in an area where their smoking will not distrub others.

4) Lunchroom Facilities

Most schedules for this course will allow a one-hour lunch break. It is advisable that the course staff identify and make known to the class the names and locations of convenient dining facilities where service, variety, quality and price are satisfactory.

5) Comments to Class about Facilities

a) On the first day of the course the general orientation should include such information as the class needs on the location and use of facilities and conveniences for class use.

b) It is strongly urged that members of the training staff never at any time indulge in apologies or criticisms of the classroom or laboratory facilities being used. Such remarks addressed to a class serve no useful purpose and can only detract from an effective program, provided that everything possible has been done beforehand to resolve

existing problems with facilities. Student comments and complaints should be given an honest response, but such comments from students should not be regarded as an excuse for staff to enlarge on the subject.

b. Classroom

1) General Features

a) Door at rear of room is preferred; this permits entry of latecomers without excessive distraction of class.

b) The classroom should be free from excessive extraneous noises, such as from construction projects, heavy traffic, or from aircraft.

c) The classroom should have adequate electric power outlets (115V) for use of audiovisual equipment. The receptacles should be inspected for assurance that they are compatible with the plugs used in the audiovisual projector equipment being used, and adapters and extension cords secured as required.

d) Room size should be adequate for seating 20 to 25 students or the number of students for which the course was designed, plus providing for instructor equipment, projection equipment, and a modest number (4 to 8) of intermittent visitors to the classroom.

e) The classroom should be capable of being darkened quickly and effectively for use of projection equipment or television. Room dimmer lights or indirect lighting (not striking the screen directly) are recommended in fixed training installations, but can be dispensed with in a field training situation.

2) Student Facilities

a) Ideally, students should be seated at tables, with all seats facing the instructor's area at the front of the classroom. Each student should be allocated 30" or more of table width. The sidearm chairs so familiar in the classrooms of secondary schools and colleges may be used if absolutely necessary, but are distinctly inferior to tables for student work.

b) Student seating should be at least two screen widths from the projection screen (assuming a 6' screen, no student should be closer than 12' from the screen) and not more than 6 screen widths from the screen (again, assuming a 6' screen, no student should be more than 36' from the screen). Furthermore, all students should be seated within a 30° angle to the left and to the right of a line from the middle of the projection screen to the projector.

3) Classroom Instructional Facilities

a) Lectern, either free-standing or table-type, suitable for standing instructor.

b) Demonstration table at front of classroom, approximately 3' x 5'.

c) Chalkboard, at least 3' x 5' (preferably larger), with chalk, erasers, pointer.

d) Audiovisual equipment

(1) Public address system (optional but recommended) with lavalier microphone with adequate cord length to permit instructor to move about at front of classroom with relative freedom.

(2) Projection screen (for size consideration see 2.b. above), matte, beaded, or lenticular surface.

(3) Projector, 35-mm slide projector for slides mounted in cardboard or plastic mounts; carousel type preferred. Several trays or slide containers should be available. Should have projection lens with cord length suitable for use from rear of room. Equipped with a remote changer

4) Laboratory

The laboratories as shown in the students manual has one laboratory with the students doing two things, i.e., turbidity and residual chlorine. If students work in groups of three, then equipment can be determined on the following basis, an example, if 24 students are attending and work in groups of three, then there are 8 groups if half does the turbidity and half the chlorine, then 4 turbidimeters and 4 chlorine kits would be needed.

The laboratory should be large enough to accommodate the students plus instructors without undue crowding. There should be sufficient electrical outlets (5-6) on the laboratory tables to permit use of the instruments. Sinks with drains and water should be available in the laboratory to facilitate washing of glassware, as well as a source of vacuum for preparing the turbidity free water. The instructor should provide an aspirator type connection for the water faucet.

A source of distilled water for about 10 gal. or 38 liters. This could be purchased or from the laboratory supply, if available.

An area should be provided to store the shipping boxes while on site. The area should have some kind of security to prevent loss or damage of valuable equipment. Arrangements to have

access to and from the building after normal working hours should be arranged to allow set-up and tear-down of laboratories.

3. Record Keeping

A few words should be said about this topic. Since the National Interim Primary Drinking Water Regulations state that anyone acceptable to the State may do the analysis for residual chlorine and turbidity, some form of record of those attending this course probably should be kept. This would facilitate assurance of whether or not the person doing an analysis had received the proper training. This record keeping would best be kept at the central location by the water supply group. The records could consist of an alphabetical list of names taken from each course roster.

4. Summary of Required Printed/Reproduced Materials

Description	Page Location of Example	When Needed
Course Announcement	17, 18, 19	5-6 months before course
Application for Admission	20	5-6 months before course
Standard Letters		
Acceptance	21	90 days before course
Who, When, Where	22	90 days before course
Biographic Statement	23	90 days before course
Full Class Waiting List	24	90 days before course
General Information	25	90 days before course
Map	26	
Motels	27, 28	
Transportation	29	
Classroom Location	30	
Forms		
Registration List	31	90 days before course
Waiting List	32	90 days before course
Roster	33	Course Day
Registration Card	34, 35	Course Day
Certificate	36	Course Day
Letter to Contact Person from Instructor	37	5-6 months before course
Student Skills Check Sheet	38, 39	5-6 months before course
Critique Forms	61	Course Day
Pre- and Post-Test	62-68	Course Day
Pre- and Post-Test Key	69	Course Day

II. EXAMPLE MATERIAL

A. Introduction

The material included here are example printed materials used at the National Training and Operational Technology Center for the Environmental Protection Agency. The course instructor should look at the examples to see which apply to his own set of circumstances. The material can be modified by using appropriate titles where needed.

B. Example Material Included here are:

- Course Announcements
- Application Form
- Letter of Acceptance
- Who, When, Where Form
- Biographic Statement
- Standby Letter (if course is filled)
- Local Facility Letter; with
  - Map
  - Motel Information
  - Bus Schedule
  - Facility Diagram
- Registration List
- Waiting List
- Roster
- Registration Card
- Certificates
- Letter from Instructor to Contact Person
- Basic Skills List
- Critique Forms for Students and Instructor
- Pre- and Post-Tests and Keys

EXAMPLE COURSE ANNOUNCEMENT

THE DETERMINATION OF RESIDUAL CHLORINE AND TURBIDITY

IN DRINKING WATER

(DATE OF OFFERING)

The State of is offering a training course for water treatment plant operators. The course is designed to instruct the operator on the requirements of the State's Safe Drinking Water Act concerning residual chlorine and turbidity.

The course will provide classroom as well as laboratory work. Such topics as sampling requirements, maximum levels, substitution of residual chlorine for bacteriological work, public notification and required analytical techniques will be covered.

After attending the course the operator will be aware of State requirements and be able to perform the analytical methods for residual chlorine and turbidity.

The course will be offered in (name of city) at (building and address) on (date).

To apply for attendance contact (name) at the following address:

ANNOUNCING TWO NEW COURSES FOR MONITORING OF DRINKING WATER SUPPLIES

The National Training and Operational Technology Center announces the presentation of two courses to be given in Cincinnati, Ohio. They are:

Methods for the Determination of Chemical Contaminants in Drinking Water (301) December 4–9, 1977, and

Methods for the Determination of Bacteriological Contaminants in Drinking Water (320) June 12–16, 1978

Since the National Interim Primary Drinking Water Regulations became effective on June 24, 1977, many treatment plants will perform new and additional analyses for compliance with the regulations. These courses will cover the approved methods specified in the regulations.

Who Should Attend

Any **laboratory personnel** who have the responsibility to perform or to supervise performance of analyses of drinking water for contaminants listed in the Interim Primary Regulations; and,

Training personnel and educators who expect to teach the knowledge and skills encompassed in these courses. These participants will receive special course-related materials, in the form of course planning and management guidance, instructor lesson plans, and information on sources and availability of audiovisual training aids.

Enrollment will be limited to 20 students for each course offering.

METHODS FOR DETERMINATION OF CHEMICAL CONTAMINANTS IN DRINKING WATER (301)

This course is for chemists and technicians with little or no experience in chemical procedures required to monitor drinking water. Applicants should have basic laboratory skills, including use of volumetric glassware.

After successfully completing the course, the student will know how to perform analyses for the inorganic and organic chemical contaminants listed in the Interim Primary Drinking Water Regulations.

The training consists of classroom instruction, student performance of laboratory procedures, and discussion of each laboratory assignment and reported results.

Course topics are arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, fluoride, nitrate and organics (chlorinated hydrocarbons, chlorophenoxys, trihalomethanes). Representative methods have been selected for student laboratory assignments. Other considerations are sample handling, quality control, data processing and drinking water regulations.

Date: December 4–9, 1977
Tuition: $175

METHODS FOR DETERMINATION OF BACTERIOLOGICAL CONTAMINANTS IN DRINKING WATER (320)

This course is for bacteriologists and technicians with little or no experience in bacteriological procedures required to monitor drinking water. Applicants should have basic skills used in bacteriology laboratory operations.

After successfully completing the course, the student will know how to perform the membrane filter and the most probable number method to determine the bacteriological contaminants listed in the Interim Primary Drinking Water Regulations.

The training consists of classroom instruction, student performance of laboratory procedures, evaluation of results, and discussion of each laboratory assignment and reported results.

Course topics are the membrane filter (MF) method and the most probable number (MPN) method to determine bacteriological contaminants. Related considerations are sample collecting, quality control, data processing and drinking water regulations.

Date: June 12–16, 1978
Tuition: $175

Persons wishing to attend these courses will be notified 30 days prior to the start of the course regarding the status of their applications.

The NTOTC awards Continuing Education Units (CEU's) to students who satisfactorily complete either of the courses described in this announcement.

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY

NEW COURSES FOR MONITORING
OF DRINKING WATER SUPPLIES
at the
National Training and
Operational Technology Center
Cincinnati, Ohio

METHODS FOR THE DETERMINATION OF CHEMICAL CONTAMINANTS IN DRINKING WATER (301)

METHODS FOR THE DETERMINATION OF BACTERIOLOGICAL CONTAMINANTS IN DRINKING WATER (320)

PRELIMINARY APPLICATION FOR TRAINING

Applicants should complete the preliminary application below, detach and mail to this office. Tuition fee should accompany this application. Checks should be made payable to U.S. Environmental Protection Agency. Applicants from Federal, State, and local agencies may send a purchase order or other acceptable evidence of financial commitment. To assure completeness of our records, accepted applicants will be asked to provide additional background information prior to the course. If more than one course is desired, please provide indicated information on separate copies.

Registrar
National Training & Operational Technology Center
U.S. Environmental Protection Agency
Cincinnati, Ohio 45268

Title of Course Desired _____ Number _____
Date
Name of Applicant _____ Phone _____
Mailing Address _____

Your Profession or Occupation _____ Years Experience _____
Brief Description of Your Present Position _____

_____

POSTAGE AND FEES PAID
U S ENVIRONMENTAL PROTECTION AGENCY
EPA-335

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Office of Water Program Operations
National Training and Operational Technology Center
Cincinnati, Ohio 45268

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE. $300
AN EQUAL OPPORTUNITY EMPLOYER

Form Approved
OMB No. 158-R0006

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EXAMPLE APPLICATION FORM

1. NAME OF APPLICANT *(First, middle, last)*
MR.
MRS.
MISS

2. TITLE OF COURSE DESIRED

3. COURSE NUMBER

4. PLACE WHERE GIVEN

5. DATES

6. SPONSOR OR EMPLOYER *(Name, address)*

City State Zipcode
Phone no.

7. MAILING ADDRESS OF APPLICANT *(If different from item 6)*

City State Zipcode
Phone no.

8. PROFESSION OR OCCUPATION

9. TOTAL YEARS EXPERIENCE IN PROFESSION

10. POSITION TITLE

11. BRIEF DESCRIPTION OF YOUR PRESENT POSITION

12. PREVIOUS WATER POLLUTION CONTROL TRAINING COURSES ATTENDED

TITLES	DATES	LOCATION

13. HIGH SCHOOL GRADUATE ☐ YES ☐ NO

14. NUMBER OF YEARS EDUCATION COMPLETED BEYOND HIGH SCHOOL

15. COLLEGE OR UNIVERSITY EDUCATION

NAME OF INSTITUTION	DATE ATTENDED	MAJOR	DEGREE

16. SIGNATURE OF APPLICANT

17. DATE

18. SIGNATURE OF APPROVING OFFICER *(Where applicable)*

19. TITLE

20. DATE

21. AGENCY USE ONLY

AMT. REC'D. _____ DATE _____ BILLING INFO. _____

TUITION FEE SHOULD ACCOMPANY COMPLETED APPLICATION.
Checks should be made payable to: U.S. Environmental Protection Agency. Applicants from Federal, State, and local agencies may send a purchase order or other acceptable financial commitment.

EPA-271 (Cin) (8-76)

SAMPLE LETTER OF ACCEPTANCE FOR TRAINING

Institutional Letterhead

Date:

Addressee

Dear _____:

A reservation has been confirmed for your participation in the course "Determination of Residual Chlorine and Turbidity in Drinking Water." The course will be presented at (address, including building and room identification if pertinent).

Class activities will begin promptly at 8:30 a.m. on Monday, (date) and the course will be completed by 4:30 p.m. Please arrange your travel schedule so that you will be in the classroom at the start of activities and that you will not have to hurry your departure.

Information about local travel, transportation, and local hotels is enclosed for your assistance in case you wish to make reservations.

We look forward to having you at the course and we will do everything in our power to make the course a pleasant and rewarding experience for you.

Sincerely yours,

Contact Person

NOTE: If something develops which makes it impossible for you to attend the course, please contact us in order that another applicant may be admitted. Please do not arrange for a substitute without first getting the approval of this office.

WHO, WHEN, WHERE

This form should be completed and sent along with the Manual or inserted in each of the participant's manuals. This will insure that each participant has a timely reminder of dates and addresses.

Date:

Welcome:

This course is being presented by the _____.

The course will begin at (time) a.m. on (date) . Please report to Room _____ at (address).

If you have any questions, please call _____ at (telephone #).

We look forward to seeing you.

Sincerely yours,

(Signature)

BIOGRAPHIC STATEMENT

Dear Participant:

We ask that you answer and complete the following items as briefly as possible. The purpose is simple: to acquaint the instructor with his/her students prior to the course.

1) Name: (please print)

2) Date:

3) Address:

4) Date of Birth:

5) Present position or job title:

6) Major job functions or responsibilities:

7) Courses or study undertaken in relation to job:

TO BE USED IF MORE APPLICATIONS ARE RECEIVED THAN THE COURSE WILL TAKE.

(SAMPLE STANDBY LETTER)

(INSTITUTIONAL LETTERHEAD)

(Date)

(Addressee)

Dear (name):

We have received your application for admission to the course "Determination of Residual Chlorine and Turbidity in Drinking Water," to be conducted at (name of institution) during the period (date to date).

We would be most pleased to enroll you in this course, but by the time we received your application, all available positions in the class had been reserved. As you may know, we limit the class size to a fixed number in order to provide for the greatest possible amount of personal instruction during the course, and to provide each participant with the greatest possible opportunity for actual practice in the laboratory.

We have made a tentative reservation for you in the next offering of the course, which is scheduled to be given (dates). If this will be satisfactory to you, please write or call us within (number) days, so that we can confirm your reservation.

In the meantime, we have placed your name on the waiting list for the course dates which you requested. If a vacancy does become available, we will let you know immediately.

Sincerely yours,

(Signature)
Course Coordinator

EXAMPLE

(INSTITUTIONAL LETTERHEAD)

(Date)

TO: COURSE PARTICIPANTS

We are looking forward to your participation in the course, "Determination' of Residual Chlorine and Turbidity in Drinking Water," scheduled for presentation at this Center during the period (date to date). If you find you cannot attend the course, please call us (telephone number).

To assist your planning preparation for this course, the following items are enclosed:

1. List of hotels and motels

2. Information on local bus transportation and city map. (NOTE: If bus service is used to the Center, you must have exact fare of $.25 on boarding the bus.)

On your arrival in the classroom you will be provided a course manual and related materials. Production schedules make it impossible to mail manuals to you in advance of course date.

The course will start at 8:30 a.m. on Monday, (date) in Classroom (#) and will close no later than 4:30 p.m. At the conclusion of the course, a certificate will be awarded to participants who have attended all sessions and met the training objectives. Please arrange your travel schedule after closing exercises. Approximately one hour should be allowed for travel from the Center to the airport.

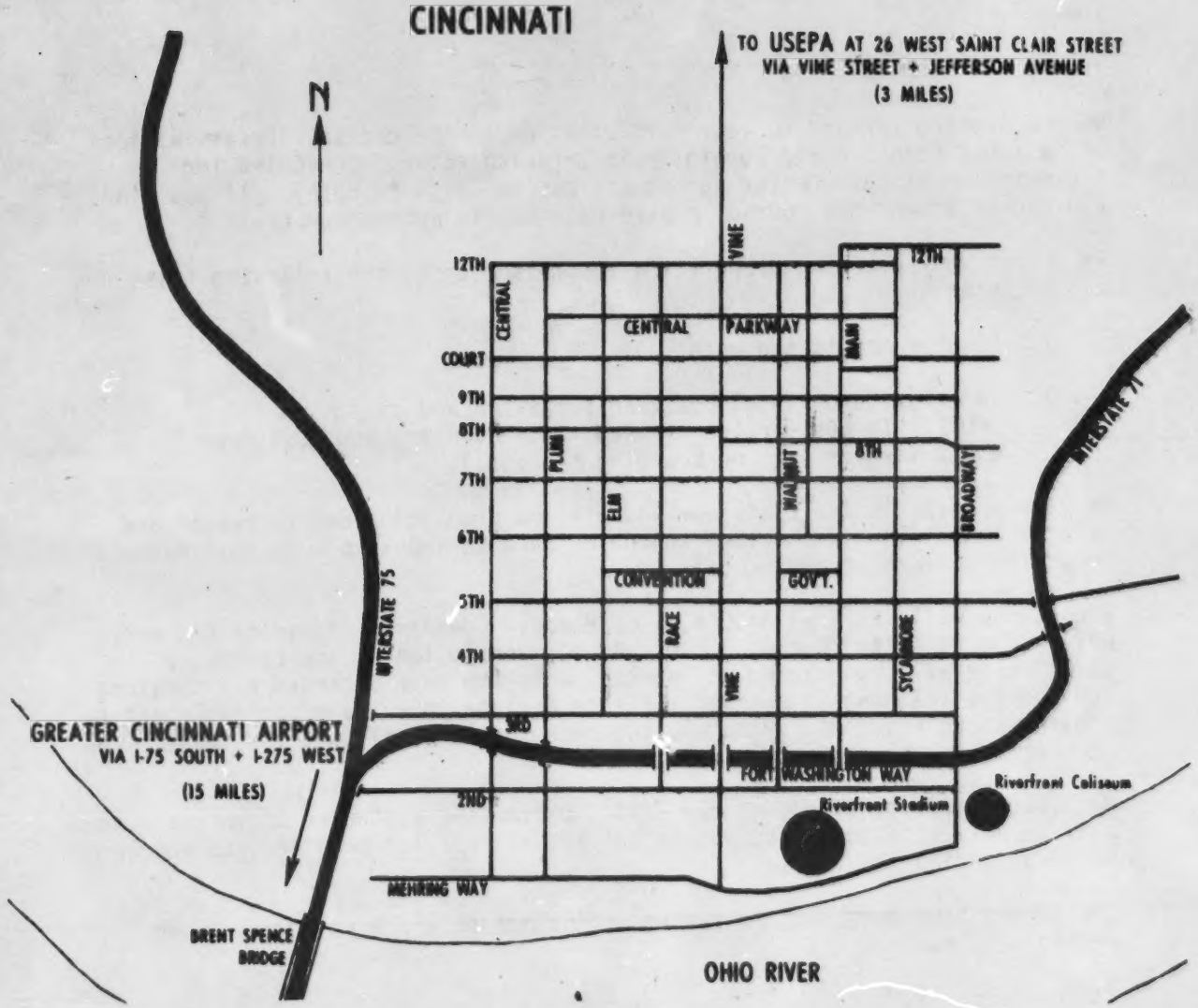
Mr. (Course Coordinator), of our staff, is serving as Course Coordinator and will be available to assist you in solving any special problems you encounter while attending the course.

Should you have questions or desire assistance in any way, please do not hesitate to contact us.

Sincerely yours,

(Signature)
Contact Person

CINCINNATI


TO USEPA AT 26 WEST SAINT CLAIR STREET
VIA VINE STREET + JEFFERSON AVENUE
(3 MILES)
N
VINE
12TH
CENTRAL
CENTRAL PARKWAY
MAIN
COURT
9TH
8TH
PLUM
ELM
WALNUT
BROADWAY
7TH
6TH
CONVENTION
GOVT.
5TH
RACE
STOWE
4TH
VINE
INTERSTATE 75
INTERSTATE 71
GREATER CINCINNATI AIRPORT
VIA I-75 SOUTH + I-275 WEST
(15 MILES)
3RD
FORT WASHINGTON WAY
Riverfront Coliseum
Riverfront Stadium
2ND
MEHRING WAY
BRENT SPENCE BRIDGE
OHIO RIVER

DOWNTOWN HOTELS

CINCINNATIAN HOTEL
6th & Vine Sts.
Cincinnati, OH 45202

Phone: 513/241-0180

Single $6.45
Double 8.60
Twin 10.75

225 Rooms. One meeting room, capacity 25, TV, restaurant adjoining.

NETHERLAND HILTON HOTEL
35 W. 5th St.
Cincinnati, OH 45202

Phone: 513/621-3800

Single $22.00 - 36.00 ($29.00 -most available)
Double 30.00 - 44.00
Twin 39.00 - 46.00

Family plan, 800 rooms, TV, meeting rooms 15, special Gov't. rates - $18.00 single, $28.00 double, $28.00 - twin.

TERRACE HILTON HOTEL
15 W. 6th Street
Cincinnati, OH 45202

Phone: 513/381-4000

Single $24.00 - 46.00
Double 31.00 - 54.00
Twin 35.00 - 54.00

Family plan, 350 rooms, meeting rooms 4, color TV, special Gov't. rates - $20.00 single, $30.00 double, $30.00 - twin.

STOUFFER's CINCINNATI TOWERS
150 W. 5th St.
Cincinnati, OH 45202

Phone: 513/721-8600

Single $25.00 - 28.00
Double 31.00 - 34.00
Twin 31.00

462 rooms, meeting rooms 11, swimming pool, cocktail lounge, sauna bath, color TV, Gov't. rates, $22.00 - single, $27.00 - double.

HOLIDAY INN *
8th & Linn Sts.
Cincinnati, OH 45203

Gov't. Rates**

Single $19.00 (includes tax)
Double 21.00 (" ")

Phone: 513/241-8660

245 rooms, meeting rooms 4, swimming pool, TV, 2 dining rooms, bars, and night club "Top of the Inn".

** Note: Gov't. Rate will be extended to any person attending an EPA meeting or training course.

NOTE: We recommend you checking the rate at the time you make your reservation in the event there has been a price increase.

These hotels and motels are listed for your information to assist you in planning for your accommodations during your stay in Cincinnati while attending our training course, and does not imply endorsement by the Office of Water Program Operations, U.S. Environmental Protection Agency.

* REQUIRES TRANSFER TO SECOND BUS.

(MARCH 1977)

SUBURBAN MOTELS

TREADWAY MOHAWK INN*
2880 Central Parkway
Cincinnati, Ohio 45225

Phone: 513/681-3330

Single $17.00 (1 dble. bed - 1 person)
Double $24.00 (2 dble. beds - 2 persons)

Gov't. rate extended to any person attending EPA Training Courses or EPA sponsored meetings. Reservation should be made in advance. Rooms will be held until 6:00 PM only unless guaranteed.

Color TV, swimming pool (outdoor), restaurant, cocktail lounge, room phone service.

Manager: Mr. George Meise

CINCINNATI TRAVELODGE*
3244 Central Parkway
Cincinnati, Ohio 45225

Phone: 513/542-3200

Single $13.50 (1 dble. bed - 1 person)
Double $19.00 (2 dble. beds - 2 persons)

Gov't. rate extended to any person attending EPA Training Courses or EPA sponsored meetings.

Color TV, swimming pool (outdoor), room phone service, restaurant next door (Frisch's)

Manager: Mr. Bill Waite

GATEWAY LODGE MOTEL OF CINCINNATI*
4453 Reading Road
Cincinnati, Ohio 45229

Phone: 513/242-2593

Single $12.00 (1 dble. bed - 1 person)
Double $14.00 (2 dble. beds - 2 persons)
" $14.00 (1 dble. bed & 1 twin bed - 3 persons)

Swimming pool (outdoor), TV, room phone service, restaurant nearby. Close to I-71 & I-75.

Owner: Mr. Richard Moore

TOWN CENTER BEST WESTERN MOTEL*
2356 Central Parkway
Cincinnati, Ohio 45225

Phone: 513/681-8100

Single $13.00 (1 dble. bed - 1 person)
Double $18.00 (1 dble. bed - 2 persons)
" $20.00 (2 dble. beds - 2 persons)

Gov't. rate extended to any person attending EPA Training Courses or EPA sponsored meetings.

Color TV, swimming pool (outdoor), room phone service, restaurant serving breakfast from 6:45 AM - 11 AM. Converts into cocktail lounge in evening.

Manager: Jim Huesing

NOTE: We recommend you checking the rate at the time you make your reservation in the event there has been a price increase. (Summer rates go into effect May 1.)

These hotels and motels are listed for your information to assist you in planning for your accommodations during your stay in Cincinnati while attending our training course, and does not imply endorsement by the Office of Water Program Operations, U. S. Environmental Protection Agency.

* REQUIRES TRANSFER TO SECOND BUS.

BUS SCHEDULE

BUS NO. 53 - AUBURN/CLIFTON

BUS NO. 78 - LOCKLAND/READING

BUS. NO. 53

Leave Sixth & Vine	Arrive St. Clair & Vine
AM	AM
7:18	7:36
7:41	7:59
8:03	8:21
8:25	8:43
8:46	9:04

BUS NO. 78

Leave Sixth & Vine	Arrive St. Clair & Vine
AM	AM
7:03	7:27
7:20	7:44
7:33	7:57
7:45	8:09
7:50	8:14

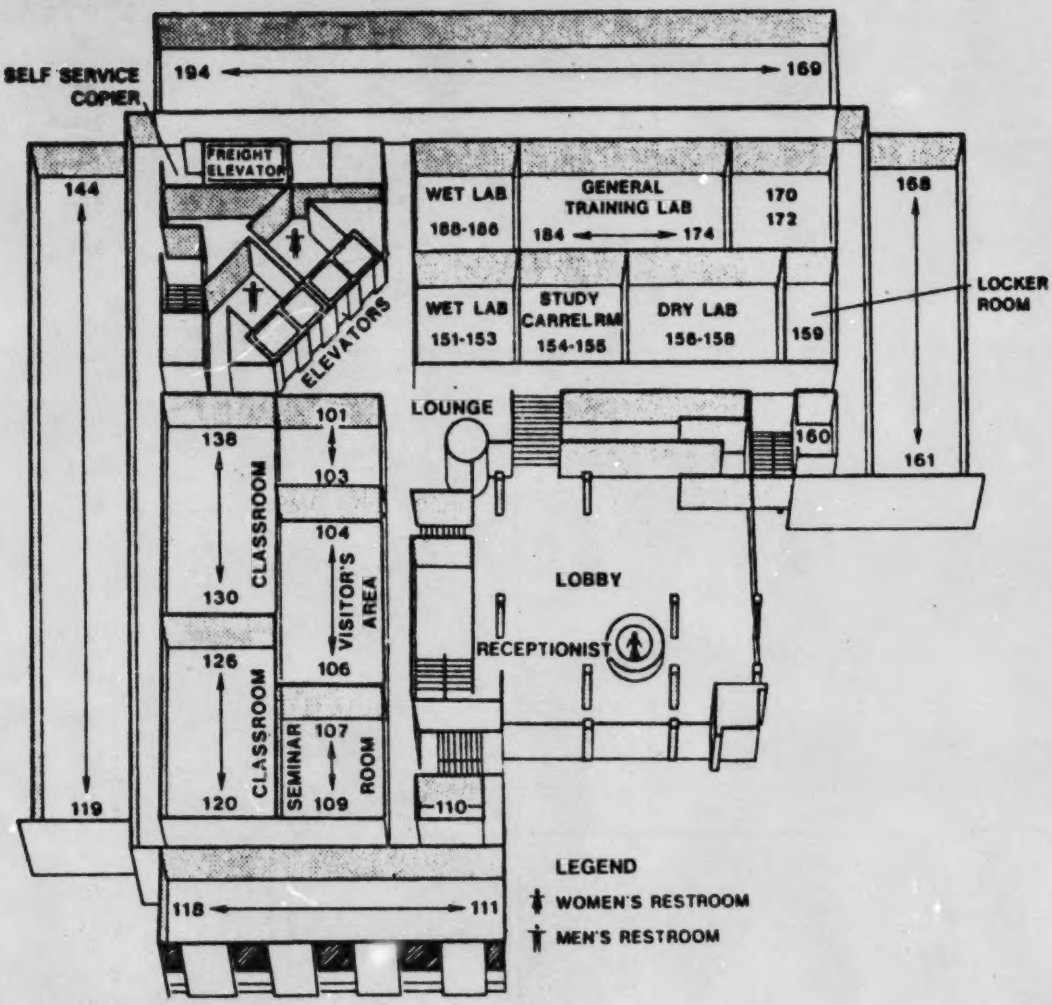
BUS NO. 53

Leave St. Clair & Vine	Arrive Sixth & Vine
PM	PM
12:30	12:48
1:02	1:20
1:33	1:51
2:05	2:23
2:36	2:54
2:58	3:16
3:21	3:39
3:41	4:02
4:04	4:25
4:28	4:49
4:52	5:13

BUS NO. 78

Leave St. Clair & Vine	Arrive Sixth & Vine
PM	PM
12:10	12:39
12:28	12:56
12:45	1:13
1:02	1:30
1:17	1:45
1:30	2:00
1:44	2:15
4:07	4:40
4:19	4:52
4:36	5:07
4:45	5:15

NOTE: The above two routes are the most direct routes to the Environmental Research Laboratory, 26 W. St. Clair Street, Cincinnati, Ohio. Information has been provided by the Queen City Metro. Times selected are those most apt to be used by students attending NTC Training Courses. Arrival times are approximate, and will vary because of road and traffic conditions.


SELF SERVICE COPIER
194
169
FREIGHT ELEVATOR
144
WET LAB 188-186
GENERAL TRAINING LAB
184
174
170
172
168
WET LAB 151-153
STUDY CARREL RM 154-155
DRY LAB 156-158
159
LOCKER ROOM
ELEVATORS
LOUNGE
101
103
160
161
138
CLASSROOM
130
104
VISITOR'S AREA
106
LOBBY
RECEPTIONIST
126
CLASSROOM
120
SEMINAR ROOM
107
109
110
119
LEGEND
WOMEN'S RESTROOM
MEN'S RESTROOM
118
111

First Floor

(SAMPLE REGISTRATION)

_____

(Course Title)

_____

(Date)

R E G I S T R A T I O N

INDIVIDUAL	WORD REC'D.	APPL. REC'D.	ACCEPT. SENT	COURSE INFO. SENT

(SAMPLE WAITING LIST SUMMARY)

WAITING LIST

INDIVIDUAL	WORD REC'D.	APPL. REC'D.	ACTION TAKEN

EXAMPLE

DETERMINATION OF RESIDUAL CHLORINE AND TURBIDITY

IN DRINKING WATER

ROSTER

Last Name, First Initial
Title
Employer
Address
City

Last Name, First Initial
Title
Employer
Address
City

Last Name, First Initial
Title
Employer
Address
City

Last Name, First Initial
Title
Employer
Address
City

TRAINEE REGISTRATION RECORD EPA-166 (Cin),(Rev.2-78)	COURSE TITLE	DATES	COURSE NUMBER
NAME (Last, First, M.I.)		U.S. CITIZEN ☐ Yes ☐ No	IF NO, LIST FOREIGN COUNTRY
POSITION TITLE	SOCIAL SECURITY NO.	LOCATION OF TRAINING	
EMPLOYER (Name, address, city, state, zip code)	LOCAL RESIDENCE DURING COURSE		
	COURSE MODERATOR		

	EDUCATION	PROFESSION OR OCCUPATION	YEARS OF PROFESSIONAL EXPERIENCE	EMPLOYER CATEGORY	"X" ONE ITEM IN EACH CATEGORY ONLY
	HIGH SCHOOL NON-GRADUATE	ADMINISTRATOR	0-1 YEARS	U.S.EPA	
	HIGH SCHOOL GRADUATE	BIOLOGIST	2-4	DI	
	COLLEGE NON-GRADUATE 1-3 YEARS	CHEMIST	5-7	ORD	
	COLLEGE NON-GRADUATE OVER 3 YEARS	CIVIC ORGANIZATION*	8-10	OPERATIONS*	
	BACHELOR DEGREE	CONSERVATIONIST	11-15	OTHER FEDERAL*	
	MASTER DEGREE	EDUCATOR	16-20	STATE GOVERNMENT	
	DOCTOR DEGREE	ENGINEER*	21 OR OVER	LOCAL GOVERNMENT	
	OTHER (describe)	GEOLOGIST		FOREIGN GOVERNMENT	
		MICROBIOLOGIST		UNIVERSITY FACULTY	
		OCEANOGRAPHER		UNIVERSITY STUDENT	
		PHARMACIST		INDUSTRY	
		SANITARIAN		CONSULTANT	
		STATISTICIAN		REGIONAL AGENCY	
		TECHNICIAN		OTHER*	
		TREATMENT PLANT OPERATOR		SPECIFY*	
		OTHER*			
		SPECIFY*			

COURSE SUMMARY RECORD
EPA 165 (CIN). (Nov. 7.73)

LOCATION OF TRAINING | COURSE TITLE | DATES

COURSE DIRECTOR | COURSE MODERATOR | NO. OF TRAINEES | COURSE NUMBER

ITEM	TALLY	TOTAL	
EPA			EMPLOYER CATEGORY
DI.			
DHEW			
DEPT. OF DEFENSE			
OTHER FEDERAL			
STATE			
LOCAL			
FOREIGN GOV'T			
UNIV. FACULTY			
UNIV. STUDENT			
INDUSTRY			
CONSULTANT			
REGIONAL AGENCY			
OTHER			
0-1 YEARS			YEARS OF PROFESSIONAL EXPERIENCE
2-4			
5-7			
8-10			
11-15			
16-20			
21 OR OVER			
ADMINISTRATOR			PROFESSION OR OCCUPATION
BIOLOGIST			
CHEMIST			
CIVIC ORG.			
CONSERVATIONIST			
EDUCATOR			
ENGINEER			
GEOLOGIST			
MICROBIOLOGIST			
OCEANOGRAPHER			
PHARMACIST			
SANITARIAN			
STATISTICIAN			
TECHNICIAN			
TREAT PLANT OPER			
HS NON- GRAD			EDUCATION
HS GRAD			
COL 1-3 YEARS			
COL OVER 3 YEARS			
BACHELOR DEGREE			
MASTER DEGREE			
DOCTOR DEGREE			
EPA			
PAID			

BY STATE OR COUNTRY OF EMPLOYMENT		
AREA	TALLY	TOTAL
ALABAMA		
ALASKA		
ARIZONA		
ARKANSAS		
CALIF.		
COLO.		
CONN.		
DELAWARE		
D. C.		
FLORIDA		
GEORGIA		
HAWAII		
IDAHO		
ILLINOIS		
INDIANA		
IOWA		
KANSAS		
KY.		
LA.		
MAINE		
MD.		
MASS.		
MICHIGAN		
MINN.		
MISS.		
MISSOURI		
MONTANA		
NEBRASKA		
NEVADA		
N. H.		
N. J.		
N. MEXICO		
NEW YORK		
N. C.		
N. D.		
OHIO		
OKLA.		
OREGON		
PENN.		
R. I.		
S. C.		
S. D.		
TENN.		
TEXAS		
UTAH		
VERMONT		
VIRGINIA		
WASH.		
W. VA.		
WISC.		
WYOMING		

14

U.S. ENVIRONMENTAL PROTECTION AGENCY

This certifies that

_____

has completed the

Presented by the

NATIONAL TRAINING AND OPERATIONAL TECHNOLOGY CENTER
Cincinnati, Ohio

_____
Director, National Training and
Operational Technology Center

_____
Course Director

EXAMPLE

LETTER TO CONTACT PERSON FROM INSTRUCTOR

(INSTITUTIONAL LETTERHEAD)

FLUORIDE DETERMINATIONS IN WATER TRAINING COURSE

In response to numerous requests to provide training in the analysis of water samples for fluoride levels, the Water Hygiene Division of EPA has developed a training course entitled "Fluoride Determinations in Water." This is primarily a laboratory course designed to provide training in the three standard methods for fluoride determinations as appearing in the 13th Edition of Standard Methods. The course was developed to be given in the field for 20-25 students in a three-day class period. A copy of the agenda is attached.

Requirements for presentation of the course are suitable classroom and laboratory space and the following basic laboratory requirements for 20-25 students:

A. Bench space - sufficient for 20-25 students in groups of two.

B. Each station must have the following:

1. Electricity - 110-120 volt, 60 Hz.
2. Gas (natural) - if only bottled gas is available, 12 burners must be provided for the gas being uses.
3. Cold water source for cooling condensers.
4. Drain.

C. Distilled water - 25 gallons

D. Acid - 3 liters concentrated sulfuric acid (Reagent Grade).

All other laboratory equipment (glassware, condensers, burners-natural gas, reagents, spectrophotometers, training manuals, etc.) are provided by the Water Hygiene Division, EPA. Participation in the course by State and/or local health authorities is expected as suggested on the attached agenda. Scheduling of the course requires about 2-3 months advance notice because of manual preparation requirements and shipping time for the laboratory equipment.

Name _____
Employer _____

EXAMPLE STUDENT SKILLS CHECKLIST

To assist us in processing applications, please check YES or NO for each of the following items:

	YES	NO
I have operated a laboratory gas burner	___	___
I have operated a laboratory hotplate/stirrer	___	___
I have operated an autoclave	___	___
I have operated a laboratory drying oven	___	___
I have used a vacuum source to filter liquids	___	___
I have used a desiccator	___	___
I have weighed items on an analytical balance	___	___
I have weighed items on a double pan balance	___	___
I have used a graduate to measure liquids	___	___
I have used a volumetric pipet to measure liquids	___	___
I have used a graduated pipet to measure liquids	___	___
I have used a pipet bulb to fill a pipet	___	___
I have used mouth suction to fill a pipet	___	___
I have used an inoculating loop to transfer small amounts of liquid	___	___
I have used disinfectant to sterilize a lab bench work area	___	___
I have poured liquid from a container into glass test tubes	___	___
I have prepared media used for coliform tests	___	___
I have used chromic acid to clean glassware	___	___
I have operated a laboratory safety shower	___	___
I have operated a laboratory eye washer	___	___
I have operated a fume hood	___	___
I have prepared manganous sulfate solution	___	___
I have made out labels for bottles or reagents	___	___
I have used a buret	___	___

Name _____
Employer _____

	YES	NO
I have used starch as a chemical change indicator	___	___
I have titrated one solution against another to a color change end point	___	___
I have recorded a reading at meniscus	___	___
I have recorded laboratory data in a laboratory notebook	___	___
I have entered laboratory data on a pre-printed form	___	___
I have recorded information about samples on record sheets	___	___
I have located required purchase information in a catalog of laboratory equipment	___	___
I have written a purchase order for chemicals to be used in the lab	___	___
Volume means space occupied by a solid, liquid, or gas	___	___
mg/l means milligrams per liter	___	___
Normality (N) is a way to express concentration in a solution . . .	___	___
1 kilogram equals 0.001 gram	___	___
1 inch equals 2.54 cm	___	___
1000 ml equals 1 liter	___	___
85 times 4.1 equals 42.5	___	___
7 minus 2 divided by 0.02 equals 250	___	___
3.26 rounded to the nearest tenth is 32.6	___	___
84.55147 rounded to the nearest thousandth is 84.551	___	___

C. Equipment Lists

1. Introduction

The purpose of this course is to instruct operators of water treatment plants in the methods of determining residual chlorine and turbidity. In doing this the State can assure itself of valid data being obtained. In order to properly instruct the operators, they should participate in the laboratory and use the instruments. There should be available to the trainees as many different models as is possible. This way the operator who is anticipating purchase of a piece of equipment may use or inspect several different models. Those persons having the equipment already can compare their instrument with the one in the laboratory.

The numbers of pieces of equipment listed here are based on the need for one group of (two or three) persons. To find the need for an entire class multiply by the number of groups in the class. The largest number of pieces of equipment has been used where choices in a procedure are given. Consequently, some extra equipment may be built in.

If the list of equipment to be supplied by the contact person is sent to him as a list, be sure to include the section on training (pg. 11-12) facilities such as the classroom and laboratory. This will describe the facilities needed.

2. Instructors Responsibility

a. Classroom Supplies

Note Paper
Pencils
Registration Cards
Critique Forms
Certificates
Manuals
Name Tags

b. Laboratory Supplies

1) For Chlorine

DPD Comparator Kit for Chlorine
4 each for up to 24 students
5 each for up to 30 students
Use different kinds of kits (i.e., manufacturers')

2) For Turbidity

Turbidimeter - Nephelometer
4 each for up to 24 students
5 each for up to 30 students
Vary the kinds used.
Manufacturer's - Secondary Standards
For rationale on numbers see pg. 53

c. Reusable Equipment

1) For Chlorine - per group of three

8 flasks, volumetric, 100 ml
1 pipet, graduated, 10 ml
1 reagent bottle, glass stoppered, 150 ml

2) For Turbidity

5 flasks, volumetric, 100 ml
4 pipets, volumetric, 10 ml

3) Basic equipment - per group of three

1 pipet bulb
1 plastic wash bottle
3 pair safety glasses
1 marking pencil, wax
1 box tissues

d. Instructor Equipment - 1 set only

1 flask, volumetric, 1000 ml
1 filtering flask, sidearm flask, 2000 ml
*1 membrane filter funnel assembly
*1 pack membrane filters - not greater than 200 µm pore size
*1 source of vacuum - can be an aspirator faucet adapter available from most laboratory supply catalogs

*For preparation of turbidity free water.

e. Consumable Supplies

1) For Chlorine - per group of three

1000 ml distilled water
100 ml Potassium Permaganate ($KMnO_4$) std.
10 each chlorine reagent (DPD) for free chlorine made by the manufacturer of the kit(s)

2) For Turbidity - per group of three

500 ml turbidity free water
100 ml 400 TU Formazin Suspension
1000 ml unknown sample, per class
dilute 17 ml of 40 TU to 1000 ml = 0.68 TU's

3) Bulk supplies of reagents to be shipped

100 ml - 4000 TU Formazin Suspension
This will be diluted 100 ml/1000 to provide 1000 ml of 400 TU Suspension. The 400 TU will be distributed to students.
1000 ml Potassium Permaganate ($KMnO_4$) std. This will be distributed to students directly.

f. Shipping

1) Boxes to contain all equipment

Should protect equipment from shock
Should be lockable
Should contain all laboratory and classroom equipment
Should have separate box (one) for reagents
Should have at least one extra box to replace one when broken
Should be small enough to be lifted by two people

3. Contact Person's Responsibility

a. Classroom Supplies

Classroom itself (for 25) - See Section on Facilities pg. 11 and 12
Student chairs or chairs and tables (preferably)
Chalkboard and chalk and eraser
Projection Screen
Projector - 2 x 2
Electrical outlets (extension cord)
Rostrum or table (for front of room)
Table (for rear of room)

b. Laboratory Supplies

Distilled water (10 gal.)
Electricity - 115 volt AC
Tapwater and sink with drain

c. Services

Lecturer - to present State's Requirements for Compliance on Chlorine and Turbidity

Typist - to prepare roster and certificates

d. Nice but not necessary

Coffee for students and staff (cups, etc.)
Contact speakers for needs: Such as flip chart, pointer, etc.

D. COURSE MODIFICATION

This section is offered to point out several modifications which the person presenting the course might wish to make. First, if it is known that the persons attending the course have never done laboratory work, a laboratory session on these basic laboratory skills can be added. With the course being offered as is, this would necessitate extending the course into another day. Such topics as use of pipets and pipetting bulbs, use of volumetric glassware and laboratory safety could be added. In States where substitution is not permitted less time may be spent on residual chlorine and the laboratory skills added. It would be well worthwhile to add the basic laboratory skills because these will play an important part in obtaining valid data.

Secondly, some States may require additional tests to be run by the operators or permit, with additional training, other type of analysis such as the microbiological tests. This course, being one day, could be offered to run along with other short courses. It could also be added to the curriculum of a community college, offering courses to upgrade the operators levels.

Last, if there are sufficient number of trainees in the area so that travel time is not important, the course could be broken into three evening sessions of two hours each. In this way the operators would not have to leave their jobs for an entire day.

EXAMPLE

AGENDA

One Day

Time	Topic	Speaker
8:30 - 9:30	Registration - Pre-Test	Contact Person
9:30 - 10:15	State (Federal) Requirements for Compliance on Chlorine and Turbidity	Administrator
10:15 - 10:30	Break	
10:30 - 11:00	Analysis for Chlorine	Instructor
11:00 - 11:45	Analysis for Turbidity	Instructor
11:45 - 12:45	Lunch	
12:45 - 1:15	Lab Briefing	Instructor
1:15 - 4:30	Laboratory 1. Chlorine 2. Turbidity	
4:30 - 5:30	Closing - Post-Test	Administrator Instructor Contact Person

INSTRUCTOR UNIT DESCRIPTION

INTRODUCTION

The following materials are topical outlines designed to list areas that should be covered under each lecture. These are examples and the lecturer must determine if any additional topics exist to be covered or if topics listed do not apply. Times are given, again as a guide and may be changed to suit the lecturer.

If the pre- and/or post-tests are to be used a copy of these should be distributed to each speaker before the course so that the speaker can be sure to cover questions in his area. If questions apply to more than one lecturer, both should be sure the material is covered. This will tend to re-enforce the topic.

Slide references are given to available media, which will be included in the package course. These have been designed from the Federal regulations and should be checked to ascertain their validity.

The laboratory sections are examples of how to carry out the laboratories. Should the instructor decide to change the laboratories, the outline will serve as reminders of things that must be thought of. Since the course is designed to be kept simple because of being offered in a location away from the home office, additional materials may be added if offered at the central location where equipment is more readily available.

INSTRUCTOR'S LESSON PLAN

Title of Course: Methods for the Determination of Turbidity and Residual Chlorine in Drinking Water

Unit Title: Federal (State) Requirements for Compliance on Chlorine and Turbidity

Purpose:
To inform the operators of water treatment plants of the requirement for residual chlorine and turbidity as required in the Primary Regulations.

Objective(s):
The operators should learn what is required of him under the Act such as sampling frequency, where to sample, what are the limits, what to do when limits are surpassed. These topics should be covered for both chlorine and turbidity.

Conditions:
The trainee should be able to understand the requirements, such as maximum levels, sampling, substitution, public notification, and other requirements. The student will be given classroom instruction and copies of all documents.

Instructional Technique:
Lecture
Discussion

This section should be presented by someone familiar with the State's program.

Performance Level:
Upon completion of this section the trainee will be able to answer correctly 70% of the questions on this section in the post-test.

Participant Material:
The outline in their manual and a copy of the Primary Regulation

Paper and Pencil

Instructor Material:
Chalkboard and equipment
Slides 19 (2x2) (pg.56)
Projector & Screen
Optional Units - State Regs.

Unit Time: 45 minutes

Activities:

Introduction	5 minutes
Chlorine	15 minutes
Turbidity	15 minutes
Public Notification	5 minutes
Summary	5 minutes

References:

Training Manual
National Interim Primary Drinking Water Regulations, Part IV, Dec. 24, 1975, pg. 59566-59574
Any corresponding State Document

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Title of Course: Methods for the Determination of Turbidity and Residual Chlorine in Drinking Water

Unit Title: Federal (State) Requirements for Compliance on Chlorine and Turbidity

Time	Lesson Unit Outline	Key Points/Cue Aids
00:00	I. Introduction	See pg. 56 for Description of Slides
	Passage on Federal Level of Safe Drinking Water Act	
	Led to NIPDWR's	NIPDWR's - See Student Manual
	State received Primacy	
	State passed their acts' - effective dates	If copies are available, pass out
00:05	II. State Act Requirements for Chlorine	
	1. Safety of Water	Slide 1 - Major Potential Disease Agents
	Diseases in water	2 - Survival of
	Chlorine as disinfectant	
	2. Substitution	
	Who may substitute	3 - Residual Chlorine Subs.
	Who approves substitution	3 - Residual Chlorine Subs.
	How do they approve	3 - Residual Chlorine Subs.
	What is required	3-4 - Residual Chlorine Subs.
	What is required if level not met	5 - Resample
	3. Sampling and Analysis	
	Who is responsible	6 - Responsibility
	What Methods	7 - Analysis 8 - Std. Methods 9 - EPA Methods
00:20	III. State Act Requirements for Turbidity	
	What is Turbidity	10 - What is Turbidity
	Who must do and how	11 - Turb. Samp. & Anal. Req.(a)
	Why	12 - Why measure Turb
	Where & When	13 - Where & When to Sample
	Exceed Limits	14-15 - Tub. Sam. & Anal. Req. (b,c &d)
	Method	
	Levels	16-17 - Max. Control Levels (a&b)
00:35	IV. Public Notification	
	Who must	18 - Public Notification
	When	19 - Public Notification
	How	
00:40	V. Summary and Questions	
00:45	Finish	

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INSTRUCTOR'S LESSON PLAN

Title of Course: Methods for the Determination of Turbidity and Residual Chlorine in Drinking Water

Unit Title: Analysis for Free Residual Chlorine

Purpose:

To acquaint the operators of water treatment plants with the required method of analysis for free chlorine. This should include methods for sampling, acceptable equipment and any calibration procedures required.

Objective(s):

The operators should know how to calibrate and carry out analysis by using the DPD kit.

Conditions:

The trainee will have the manual and its outlines and will participate in a laboratory to use what has been presented here.

Instructional Technique:

Lecture
Discussion
Demonstration

This lecture should be presented by someone familiar with the analysis and what will be done in the laboratory.

Performance Level:

Upon completion of this section the trainee will be able to answer correctly 70% of the questions on this section in the post-test.

Participant Material:

The manual
Copy of Fed. NIPDWR's
Copy of the State Doc.
Paper and Pencil
Page from Criteria Document - Student Manual

Instructor Material:

Chalkboard and equipment
Projector & Screen
Slides - 16 (2x2) (pg. 57)
DPD Kits & Standards
Optional Units - See pg. 70

Unit Time: 30 minutes

Activities:

Introduction	2 minutes
Basic Principles	5 minutes
Instrument Design	5 minutes
Factors Affecting	5 minutes
Calibration	5 minutes
Available Equipment	5 minutes
Summary	3 minutes

References:

National Interim Primary Drinking Water Regulations, Fed. Reg., Part IV, Dec. 24, 1975, pg. 59566-59574.
Standard Methods for the Examination of Water and Wastewater, 13th ed., 1971, pg. 129-132, APHA, AWWA, WPCF, 1015 18th St., N.W., Washington, DC 20036
Standard Methods for the Examination of Water and Wastewater, 14th ed., 1976, pg. 329-334, APHA, AWWA, WPCF, 1015 18th St., N.W., Washington, DC 20036
Manual for the Interim Certification of Laboratories Involved in Analyzing Public Water Supplies, Sept. 1977, USEPA, Water Supply Quality Assurance Work Group, Washington, DC 20460

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INSTRUCTOR'S LESSON PLAN

Title of Course: Methods for the Determination of Turbidity and Residual Chlorine in Drinking Water

Unit Title: Analysis for Free Residual Chlorine

Time	Lesson Unit Outline	Key Points/Cue Aids
00:00	I. Introduction	See pg. 57 for Description of Slides
	Regulations Safe Drinking Water Act National Inter. Prim. Drinking Water Regulations State Regulations Past Regulations	Copy in Student Manual Slide 1 - Responsibility
00:02	II. Basic Principles	
	1. Forms of Chlorine 2. The Method	Slide 2 - Forms 3 - Dissociation 4 - Below 1000 ppm 5 - Forms with pH 6 - Analysis - Regulations 7 - Comments 8 - Preservation
00:07	III. Instrument Design	Show Kits that will be used in laboratory
00:12	IV. Factors affecting the DPD Test	
	Interferences Reagents	
00:19	V. Calibration	Slide 9 - Calibration
	Criteria document With $KMnO_4$	Page excerpted from document - See Student Manual
00:22	VI. Available Kits	10 - Kits Available 11-16 - Photo's of Kits
	Hach Hellige LaMotte	
00:27	VII. Summary	
00:30	Closing	

INSTRUCTOR'S LESSON PLAN

Title of Course: Methods for the Determination of Turbidity and Residual Chlorine in Drinking Water

Unit Title: Analysis for Turbidity

Purpose:

To acquaint the operators of water treatment plants with the required method of analysis for turbidity. This should include the topics as listed on page 2.

Objective(s):

The operators should know how to calibrate and operate the instrument.

Conditions:

The trainee will have the manual and be shown slides of various instruments. The use of the instruments should be demonstrated. The preparation of the formazin standard should be covered along with its use for calibration.

Instructional Technique:

Lecture
Discussion
Demonstration

This lecture should be presented by someone familiar with the analysis and what will be done in the laboratory.

Performance Level:

Upon completion of this section the trainee will be able to answer correctly 70% of the questions on this section in the post test.

Participant Material:

The manual
Copy of Fed. NIPDWR's
Copy of State Regs.
Paper and Pencil

Instructor Material:

Chalkboard and equipment
Projector & Screen
Slides - 20 (2x2)(py. 58)
Turbidimeters
Filtration Equipment
Optional Units - See pg.70

Unit Time: 45 minutes

Activities:

Introduction	5 minutes
Basic Principles	5 minutes
Instrument Design	5 minutes
Factor Affecting	10 minutes
Standardization	5 minutes
Stocks Available	5 minutes
Instruments Available	5 minutes
Summary	5 minutes

References:

Standard Methods for the Examination of Water and Wastewater, 13th ed. 1971, pg. 350-353, 14th ed., 1976, pg. 132-134, APHA, WPCF, 1015 18th St., NW, Washington, DC 20036.
Manual of Chemical Analysis of Water and Wastes, 1974, USEPA, Tech. Transfer, Cincinnati, OH 45268.
Manual for the Interim Certification of Laboratories Involved in Analyzing Public Drinking Water Supplies, Sept. 1977, USEPA, The Water Supply Quality Assurance Work Group, Washington, DC 20460.

Title of Course: Methods for the Determination of Turbidity and Residual Chlorine in Drinking Water

Unit Title: Analysis for Trubidity

Time	Lesson Unit Outline	Key Points/Cue Aids
00:00	I. Introduction	See pg. 58 for Desdription of Slides
	Federal Regulations concerning turbidity State Regulations concerning turbidity History of turbidity measurement	Slide 1 - Jackson Candle Turbidimeter
00:05	II. Basic Principles	
	What is turbidity How nephelometers works	2 - What is turbidity
	Preservation	3 - Preservation
00:10	III. Instrument Design	
	Requirement in Standard Methods	4 - Design Criteria
	Light Path	5-6 - Instrument Design
00:15	IV. Factors Affecting Turbidity Readings	
	Interferences	7 - Interferences
	Meter Units - JTU - FTU- NTU- TU Turbidity Free Water	8 - Turbidity Free Water
00:25	V. Standarization	
	Materials Use in Past Now How to Make Secondary Std.	9-10 - Formazin Polymer
00:30	VI. Stocks Available	Table in Student Manual
00:35	VII. Instruments Available	Slides 11-16 - Instruments 17-18 - Instrument Controls 19 - Standards 20 - Filter
00:40	VIII. Summary	
00:45	Closing	

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INSTRUCTOR'S LESSON PLAN

Title of Course: Methods for the Determination of Turbidity and Residual Chlorine in Drinking Water

Unit Title: Laboratory Procedure: Chlorine

Purpose:

To allow the operators of water treatment plants to become familiar with the various types or "kits" available.

Objective(s):

To familiarize the trainee with
- Use of instrument
- Types available
- Calibration of the instrument

Conditions:

The trainee will have a DPD Kit, a Standard Potassium Permanganate Solution.
DPD reagent for free chlorine.
The trainee should use the procedure in his manual and calibrate the visual standards.
The trainee should determine the free chlorine in the tap water.

Instructional Technique:

Laboratory work by the trainee. He should actually standardize a "Kit" and use it on the tap water.

Performance Level:

The trainee should obtain the same value as the rest of the class within ±10% of the median class value of the tap water.

Participant Material:

Kit
Reagent
Distilled Water
Glassware - See List pg. 40-41

Instructor Material:

See List pg. 41

Unit Time: 90 minutes (approx.)

References:

Participants Manual Outline in Student Manual

Activities:

At trainee's pace
- Calibrate visual standards
- Run tap water

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Title of Course: Methods for the Determination of Turbidity and Residual Chlorine in Drinking Water

Unit Title: Laboratory Procedure: Chlorine

Time	Lesson Unit Outline	Key Points/Cue Aids
1:30	Pre-Laboratory activity Class Division Divide class into groups of 2 or 3. Divide groups in half. First half start with chlorine. Second half start with turbidity. When a group is finished begin the other procedure. This necessitates only 4 or 5 pieces of equipment. Reagent Preparation Instructor prepares before lab, 1000 ml of Standard Potassium Permanganate ($KMnO_4$) Solution (See Participant's Manual E4 IIC) and dispenses this to trainees as is. The trainees begin here. Laboratory Procedure Prepare dilutions of Std. $KMnO_4$ (E4,IID) Carry out E4 IV A 1-14 Carry out E4 V	

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INSTRUCTOR'S LESSON PLAN

Title of Course: Methods for the Determination of Turbidity and Residual Chlorine in Drinking Water

Unit Title: Laboratory Procedure: Turbidity

Purpose:

To allow the operators of water treatment plants to become familiar with the various types of instruments available.

Objective(s):

To familiarize the trainee with
- Use of the instrument
- Types available
- Calibration of instrument
- Checking secondary standards

Conditions:

The trainee will have a turbidimeter, a stock (400 TU) Formazin Suspension, the manufacturer's secondary standards. The trainee should use the procedure in his manual and calibrate the ranges and secondary standards, and run the tap water.

Instructional Technique:

Laboratory work by the trainee. He should actually standardize the instrument and secondary standards and use the instrument in a tap water sample.

Performance Level:

His technique must be acceptable to the instructor and fall within ± 0.05 TU's of the class median value of the tap water read on the 0 to 1 of 0 to 2 scale.

Participant Material:

Turbidimeter
Secondary Std(s)
Turbidity free water
Glassware - See List pg. 40-41

Instructor Material:

See pg. 41

Unit Time: 90 minutes

References:

Participant's Manual - Outline E5.

Activities:

At trainee's pace
- Calibrate secondary standards
- Run tap water

INSTRUCTOR'S LESSON PLAN

Title of Course: Methods for the Determination of Turbidity and Residual Chlorine in Drinking Water

Unit Title: Laboratory Procedure: Turbidity

Time	Lesson Unit Outline	Key Points/Cue Aids
1:30	Preliminary Activity Class Division - See pg. 53 Reagent Preparation Instructor should prepare ahead of time 100 ml of 4000 TU Formazin Suspension. Day before class Dilute 100 ml of 4000 TU Formazin to 1000 ml this is the 400 TU to dispense to the students. Prepare unknown sample (See pg. 41). The instructor should prepare turbidity free water by filtering enough distilled water to fill all wash bottles and then prepare as needed during laboratory. The Trainees begin here. Student Laboratory Procedure - Use E5 Prepare dilutions of Stock - 400 TU See E5-IIC Standardize Turbidimeter ranges See E5-IVA 1-16 Run tap water as sample - E5-V B	

VISUAL AIDS DESCRIPTION

Keyed Slides

E-1 Federal (State) Requirements for Compliance on Chlorine and Turbidity

Slide 1 - Titles - Major Potential Waterborne Disease Agents

Bacteria	Viruses	Parasitic
---	---	---
---	---	---
---	---	---

2 - Graph - Survival of Esch Coli Exposed to Chlorine

3 - Title - Residual Chlorine Substitution (Federal)

4 - Title - Residual Chlorine Substitution (Federal)

5 - Title - Residual Chlorine Resample

6 - Title - Residual Chlorine Responsibility

7 - Title - Residual Chlorine Analysis

8 - Photo - 14th Std. Methods

9 - Photo - 1971 EPA Methods Manual

10 - Title - What is Turbidity

11 - Title - Turbidity Sampling and Analytical Requirements (a)

12 - Title - Why Measure Turbidity

13 - Title - When & Where to Sample

14 - Title - Turbidity Sampling and Analytical Requirements (b)

15 - Title - Turbidity Sampling and Analytical Requirements (c & d)

16 - Title - Maximum Contaminant Levels for Turbidity (a)

17 - Title - Maximum Contaminant Levels for Turbidity (b)

18 - Title - Public Notification

19 - Title - Public Notification

E-2 Analysis for Residual Chlorine

Slide 1 - Title - Residual Chlorine Responsibility

2 - Title - Residual Chlorine Forms (Total-Combined-Free)

3 - Title - Residual Chlorine Dissociation (Formula's)

4 - Title - Residual Chlorine Forms (Normal Free Forms)

5 - Title - Residual Chlorine Forms (Effect of pH)

6 - Title - Residual Chlorine Analysis (References)

7 - Title - Residual Chlorine Analysis (Kit Permit)

8 - Title - Residual Chlorine Method (Preservation and Container)

9 - Title - Residual Chlorine Method (Calibration)

10 - Title - Residual Chlorine Kits (Manufacturers)

11 - Photo - Hach and LaMotte - Closed

12 - Photo - Hach and LaMotte - Open

13 - Photo - Hach and LaMotte - Open

14 - Photo - Hach and LaMotte std's - Close-up

15 - Photo - Hach and LaMotte std's - Close-up

16 - Photo - Hach and LaMotte std's - Close-up

E-3 Analysis for Trubidity

Slide 1 - Drawing - Jackson Candle Trubidimeter

2 - Title - What is Turbidity

3 - Title - Preservation

4 - Title - Design Criteria for Instruments

5 - Drawing - Optical System - One

6 - Drawing - Optical System - Two

7 - Title - Interferences

8 - Title - Turbidity Free Water

9 - Title - Formazin Polymer - One

10 - Title - Formazin Polymer - Two

11 - Photo - Instruments

12 - Photo - Instruments

13 - Photo - Instruments

14 - Photo - Instruments

15 - Photo - Instruments

16 - Photo - Instruments

17 - Photo - Controls of Hach + HF

18 - Photo - Controls of Hach + HF

19 - Photo - Secondary Std. - Hach + HF

20 - Photo - Filter Apparatus

COURSE ASSESSMENT AND EVALUATION

Introduction

The material in this section has been included to aid the instructor and author in assessing the course. All materials should be considered as examples to be modified by the instructor. The only exception would be the forms for the instructor's evaluation of the course.

The students critique forms should be filled out at the end of the course. However, it is a good idea to give the form to, or at least tell the, students that there will be such an evaluation. By letting them know about this critique at the beginning of the course they can take notes on comments they would like to make as the course progresses. It has been found that critiques are best when the student can respond in their own words, consequently, comments should be solicited only on general topics.

The pre-post-tests are a form used to evaluate the course not the student. By using both a measure of how much and what information was imparted to the students. The use of this test is strictly up to the instructor. A copy of the pre-test is in the participant's manual and could be left there even if not used. The trainee can be told simply to look at it and ask questions on any topic he does not understand. Keys to be used for correcting the tests are included in this manual.

METHOD FOR DETERMINATION OF TURBIDITY AND RESIDUAL CHLORINE IN DRINKING WATER

Instructor Feedback Report

DATE LOCATION

INSTRUCTOR NUMBER OF TRAINEES:

NOTE TO THE INSTRUCTOR: This report is presented as a guide to assist you in giving your impressions of the course manual and course content. As the course is used, if sufficient reports warrant it, the course can be revised. The comments of the persons using the course manual will aid in this revision. When completed mail to PSTB, NTOTC, USEPA, Cincinnati, Ohio 45268.

THE PARTICIPANTS

1. Did they grasp the information presented?

2. Did they need additional lessons (if so, on what subject).

THE COURSE

1. Was sufficient time allotted, to the lectures, to the laboratories?

2. Were instructions clear, to the participant, to the instructor?

THE MANUAL

1. Are additions necessary?

2. Should any sections be removed?

3. Any additional comments on the manuals

   a. Participant's manual

   b. Instructor's manual

CRITIQUE

1. What were your objectives for attending this course?

2. Were your objectives fulfilled? Why?

3. What were the strong points of the course?

4. What were the weak points of the course?

5. Have you any suggestions to improve the course?

6. Additional comments.

_____

Participant

PRE- AND POST-TEST

This test should be given to the students at the start of the training course and at the end of the course. The difference between his first score and his final score will indicate how well and how much information the student has obtained during the course. In order to have some measure of how well the student has done in the course, the tests can be used in two ways. First, the student can be required to increase his score by a certain amount before he can be said to have satisfactorily completed the course. Secondly, he may be required to obtain a certain grade on the final or post-test offering to be judged on.

The test has been designed around the three lectures and could be offered to the student only once, that is, right after he has attended the lecture. He could be graded on each lecture in this manner.

The performance level section in the Instructor's Lesson Plan is based upon the student correctly answering 70% of the questions in each section at the end of the course. The evaluation of student performance in the laboratory can be judged by his performance on an unknown sample, i.e., the tap water.

When used as a pre- and post-test the students should not be told the post-test is the same as the pre-test. The answers to the questions can be given to the students after they have completed the test. However, they should be told that all the questions will be answered in the lectures and if not answered to their satisfaction, they should question the speaker. After using the test as the post-test, discuss any questions that are not clear to the students.

Before the class begins, be sure to obtain enough copies of the test for each student to have two copies. Another way to work the test is to provide a blank piece of paper and request the students to place their answers on this paper and not on the questions. Then the same copies can be handed back to the students as the post-test.

TEST

FEDERAL REQUIREMENTS FOR COMPLIANCE ON CHLORINE AND TURBIDITY

1. The reason for the MCL on turbidity is because turbidity

   a. may interfere with disinfection
   b. makes water look bad
   c. makes water taste bad
   d. may settle out in the distribution system
   e. may shorten filter runs

2. The MCL for turbidity is applicable to

   a. all public and private water supplies
   b. all community and non-community supplies
   c. only community supplies
   d. all community and non-community supplies which use surface waters
   e. all community and non-community supplies which use ground waters

3. The turbidity sample must be taken

   a. in the plant
   b. anywhere
   c. at the entry point to the distribution system
   d. at the end of the distribution system
   e. somewhere in the distribution system

4. The MCL, based on a monthly average, for turbidity is

   a. 5 TU's
   b. 3 TU's
   c. 2 TU's
   d. 1 TU
   e. 0.5 TU's

5. Analysis for turbidity must be carried out by

   a. anyone acceptable to the State
   b. the Federal regional personnel
   c. a laboratory that the State has approved
   d. the State personnel
   e. the consumer

6. The analysis for residual chlorine is required

   a. because it is published in the regulatory document
   b. because it is a health hazard
   c. to assure a residual in the distribution system
   d. to monitor for filter breakthrough
   e. only if substitution is carried out

7. Substitution may be carried out if

   a. the operator wishes to substitute
   b. only after the State has received primary responsibility
   c. only after approval has been granted by the authority
   d. only if the supply is chlorinating
   e. only if the State grants a blanket approval for a substitution

8. The level of free residual chlorine that must be maintained in the distribution system if substitution is practiced is

   a. 0.1 mg/liter (ppm)
   b. 0.2 mg/liter (ppm)
   c. 0.3 mg/liter (ppm)
   d. 0.4 mg/liter (ppm)
   e. 0.5 mg/liter (ppm)

9. The maximum number of microbiological samples that may be substituted for are

   a. 75%
   b. 50%
   c. depends on the size of the plant
   d. 25%
   e. depends on who does the analysis

10. If the required levels for chlorine and/or turbidity are not met, the supply must notify

   a. the State
   b. the consumers
   c. the Federal region
   d. the State and federal region
   e. the State and the consumers

ANALYSIS FOR CHLORINE

1. The approved method for analysis of free residual chlorine in drinking water is the

   a. Orthotolidine
   b. amperometric titration
   c. DPD test
   d. iodometric
   e. OTA

2. The "Kit" or Comparator form of the approved method

   a. can be used if approval granted
   b. must be applied for under alternative test procedures
   c. may not be used
   d. may be used
   e. can be used only for operational testing

3. The chlorine sample is to be taken

   a. in the plant
   b. at the first tap
   c. at the entrance to the distribution system
   d. at the end of the system
   e. at points representative of the conditions within the distribution system

4. The sample for chlorine may _____ be for analysis.

   a. be held overnight
   b. be held 24 hours
   c. be held 48 hours
   d. not be held longer than one hour
   e. be held for 2 hours

5. The analysis for chlorine must be done for _____ chlorine

   a. total
   b. combined
   c. mono and dechloramines
   d. free
   e. total and free

6. It is recommended that the visual standards in the chlorine kit _____ _____.

   a. do not need calibration
   b. need calibration before each use
   c. need calibration every week
   d. need calibration every month
   e. need calibration every six months

7. The test for chlorine must be read _____ after addition of the reagent.

   a. within one minute
   b. within three minutes
   c. any time
   d. within one hour
   e. within five minutes

8. One procedure for calibrating the visual standards for chlorine involves the use of _____.

   a. a chlorine solution
   b. a manufacturer's standard
   c. an orthotolidine standard
   d. potassium permanganate
   e. chlorobenzene standard

9. Analysis for chlorine may be done by the _____ procedure.

   a. DPD colorimetric (spectrophotometer)
   b. DPD titrimetric
   c. DPD comparator
   d. any
   e. OTA kit

10. Analysis for chlorine must be carried out by

   a. any one acceptable to the authority
   b. the Federal regional personnel
   c. a private laboratory the State has approved
   d. the State personnel
   e. the consumer

ANALYSIS FOR TURBIDITY

1. Which of the following units may be used to express turbidity values?

   a. NTU's
   b. FTU's
   c. mg/l's (ppm)
   d. JTU's
   e. TU's

2. Turbidity measurements must be made

   a. a number of times based on the population served
   b. hourly
   c. daily
   d. monthly
   e. quarterly

3. The method to be used to measure turbidity is based upon

   a. transmission of light
   b. absorption of light
   c. scattering of light
   d. the use of the Jackson Candle turbidimeter
   e. nephelometry

4. The standards supplied by the manufacturer

   a. do not need calibration
   b. need to be replaced only if broken
   c. need to be monitored for deterioration every four months
   d. need to be calibrated once
   e. need to be monitored for deterioration every month

5. The method for calibration of the turbidimeter is the use of

   a. the Jackson Candle
   b. formazin
   c. Fuller's earth
   d. a filter
   e. a plastic rod

6. The stock turbidity formazin suspension (400 units) is stable for

   a. one day
   b. three days
   c. one week
   d. three weeks
   e. one month

7. Good practice for handling the sample cells used in the turbidimeter include

   a. a wiping with a soft tissue before placing it in the instrument
   b. not touching it where the instrument's light strikes it
   c. discard the sample cells when scratched
   d. keep the cells very clean
   e. store the cells in a safe place

8. The user of a turbidimeter _____ stock (400 unit) formazin suspension.

   a. must have the State prepare his
   b. may purchase the
   c. may do his own preparation of the
   d. does not need a
   e. none of the above

9. Dilutions of the stock formazin suspension should be used for

   a. one day
   b. one week
   c. one month
   d. two months
   e. indefinitely

10. The maximum reading on a turbidimeter that may be used without dilution is

   a. 1000 TU's
   b. 400 TU's
   c. 100 TU's
   d. 40 TU's
   e. 10 TU's

KEY FOR PRE-POST TEST

Federal Requirements for Compliance

1.a
2.d
3.c
4.d
5.a
6.e
7.c
8.b
9.a
10.e

Analysis for Chlorine

1.c
2.d
3.e
4.d
5.d
6.e
7.a
8.a,d
9.a,b,c
10.a

Analysis for Turbidity

1.a,b.e
2.c
3.c,e
4.c
5.b
6.e
7.a,b,c,d,e
8.b.c
9.b
10.d

OPTIONAL UNITS

Federal (State) Requirements for Compliance on Chlorine and Turbidity

Analysis for Residual Chlorine

American Water Works Association - The Safe Drinking Water Act, Presentation 3, Chlorine Residual Workshop No. 1614, Cost $1800 - 45 slides and tape AV presentation

Analysis for Turbidity

American Water Works Association - The Safe Drinking Water Act, Presentation 2, Turbidity Workshop No. 1613, Cost $1800 - 48 slides and tape AV presentation

National Interim Primary Drinking Water Regulations - Copy in Student Manual.